REMARKS

Claims 1-19, 21-27 and 29-34 are pending in the present Application. Claims 1, 2, 12, 22, 25, 32 and 33 are amended by the present Amendment.

The Applicants respectfully request reconsideration of the Application in light of the foregoing amendments and the following remarks.

I. THE CLAIMS MEET THE REQUIREMENTS OF 35 USC 112

A. Paragraph 1 Rejection of Claims 1-24

In paragraph 1 of the Office Action, claims 1-24 were rejected under 35 U.S.C. 112, second paragraph as assertedly being incomplete for omitting essential elements. Specifically, it was asserted that the claims must recite a structure to convert NO_2 into NO in a hot wet gas sample prior to water removal. This is assertedly required in order to conform to a statement in paragraph 28 of the specification that "the invention uses a fundamentally different approach."

The Applicants respectfully disagree that the independent claims as examined are incomplete. More particularly, the Applicants disagree that the statements made in the specification indicate that a structure for conversion of NO_2 to NO in a hot wet gas is required for all embodiments of the invention. The specification text referred to by the Examiner states as follows:

> "Figure 2 is a schematic illustration of a CEMS 100 according to the present invention. The CEMS 100 uses a fundamentally different approach to NO_2 concentration measurement in that it uses an NO_2 converter 136 that is specifically designed and configured for use on hot, wet gas samples." Application, paragraph 28, fourth sentence.

The Applicants note that while the embodiment shown in Figure 2 includes an NO_2 converter, there is nothing in the specification that confines the invention to this embodiment. Independent claim 1 as originally filed, for example, is not confined to systems having an NO_2 converter.

Although the Applicants disagree with the basis for the Examiner's rejection for the reasons stated above, the Applicants have nevertheless amended the claims in order to advance prosecution of the application. Claims 1 and 22 have been amended to include an NO_2 converter disposed in the chamber interior, the NO_2 converter being operable at temperatures above the

dew point of the sample gas. Claim 1 has been further amended to clarify that the means for removing water is downstream of the chamber. Claim 22 has been further amended to clarify that the dryer is downstream of the NO_2 converter. Claim 12 has been amended to recite that the NO_2 converter is operable at temperatures above the dew point of the sample gas.

The Applicants respectfully submit that claims 1-24 meet the requirements of 35 U.S.C. 112, second paragraph. The Applicants therefore request that the rejection of claims 1-24 under 35 U.S.C. 112 be withdrawn.

B. Paragraph 2 Rejection of Claims 25-34

In paragraph 2 of the Office Action, claims 25-34 were rejected under 35 U.S.C. 112, second paragraph as assertedly being incomplete for omitting essential steps. Specifically, it was asserted that the specification indicates that "some requirements need to be met relative to the type of NO_2 converter and the order in which the steps are performed." It was further asserted that "there is not a clear order for when the water is removed from the gas sample relative to the NO_2 conversion."

As discussed above, the Applicants do not agree that the specification can be read as requiring a converter of a particular type. The Applicants also disagree that the specification mandates the precise order of the steps of the method. Nevertheless, the Applicants have amended the claims in order to advance the prosecution of the application. Claim 25 has been amended to recite that the converting action is carried out by an NO_2 converter adapted for operation at temperatures above the dew point of the sample gas and to recite that the dryer used to carry out the action of removing water is positioned downstream of the NO_2 converter. Claim 32 has been amended to recite that the action of converting NO_2 is carried out by passing the sample gas through a catalytic NO_2 converter while maintaining the temperature of the sample gas above the dew point temperature of the gas. Claim 34 has been amended to add the action of converting NO_2 in the cooled sample gas to NO by passing the sample gas through a catalytic NO_2 converter adapted for operation at temperatures above the dew point temperature of the sample gas.

The Applicants respectfully submit that claims 25-34 meet the requirements of 35 U.S.C. 112, second paragraph. The Applicants therefore request that the rejection of claims 25-34 under 35 U.S.C. 112 be withdrawn.

II. THE CLAIMS ARE PATENTABLE OVER THE CITED ART

A. Paragraph 4 Rejection of Claims 1, 8-11, 22, 24, 25, 27, 29-31, 33 and 34.

In paragraph 4 of the Office Action, claims 1, 8-11, 22, 24, 25, 27, 29-31, 33 and 34 were rejected under 35 U.S.C. 102(b) as assertedly anticipated by "Applicant's admission of prior art" as shown in Figure 1 of the Application.. The Applicants respectfully traverse this rejection.

1. Independent Claims 1, 22 , 25 and 33

Independent claim 1 recites an emissions monitoring system comprising a sampling device; a chamber positioned adjacent the stack; means for maintaining in the chamber interior a temperature above a dew point temperature of the sample gas; at least one sample gas line at least a portion of which is disposed in the chamber interior; means for removing particulate matter from the sample gas; an NO_2 converter in the chamber interior downstream of the means for removing particulate matter, the NO_2 converter being operable at temperatures above the dew point temperature of the sample gas; means for removing water from the sample gas, the means for removing being disposed adjacent the chamber and being in fluid communication with the at least one sample gas line downstream of the chamber; and at least one analyzer downstream of the means for removing water, each of the at least one analyzer being configured for determination of a concentration level of a constituent in the sample gas.

Independent claim 22 recites an emissions monitoring system comprising a sampling; a chamber positioned adjacent the stack; a chamber heater adapted for maintaining in the chamber interior a temperature above a dew point temperature of the sample gas; at least one sample gas line at least a portion of which is disposed in the chamber interior; a filter disposed adjacent the stack, the filter being in fluid communication with the at least one sample gas line; an NO_2 converter disposed in the chamber interior in fluid communication with a first one of the at least one sample gas line downstream of the filter, the NO_2 converter being operable at temperatures

above the dew point temperature of the sample gas to convert NO_2 gas in the sample gas to NO gas; a dryer disposed adjacent the chamber downstream of the NO_2 converter; and at least one analyzer downstream of the dryer, each of the at least one analyzer being configured for determination of a concentration level of a constituent in the dried filtered sample gas.

Independent claim 25 recites a method of monitoring a concentration level of NOx, the method comprising the steps of: capturing sample gas using a sample gas probe; cooling the sample gas to a temperature below about 350 °F but above a dew point temperature of the sample gas; converting NO_2 in the cooled sample gas to NO by passing the sample gas through a catalytic NO_2 converter adapted for operation at temperatures above the dew point temperature of the sample gas; removing water from the sample gas by passing the gas through a dryer downstream of the NO_2 converter; and determining a sample gas NO concentration level.

Independent claim 33 is similar to claim 25 except that it recites a method of monitoring a concentration level of a non-specific constituent rather than NOx. The method of claim 33 comprises capturing, cooling, removing particulate matter, converting NO_2, and removing water steps that are essentially similar to steps in claim 25. The method further comprises: measuring a sample gas flow rate downstream of the dryer; determining a sample gas constituent concentration level; introducing a span gas having a known span gas constituent concentration level into the sample gas upstream of the catalytic NO_2 converter to form a combined sample and span gas flow; measuring a combined sample and span gas flow rate downstream of the dryer; determining a combined sample and span gas constituent concentration level; and determining an overall system bias using the known span gas constituent concentration level, the sample gas constituent concentration level and the combined sample and span gas constituent concentration level.

2. Figure 1 of the Application Does Not Disclose the Features of Claims 1, 22, 25 and 33

As discussed in the Application, Figure 1 is a schematic illustration of a typical prior art emissions monitoring system. Application paragraph 19. Figure 1 depicts a system that includes, in sequence, a dryer, an NO_2 converter and an NO analyzer, each of which is disposed in an analysis room spaced apart from the exhaust stack from which sample gas is drawn.

The features of claims 1, 22, 25 and 33 are easily distinguishable from the system depicted in Figure 1 of the Application. Claims 1 and 22, for example, each recite a system comprising an NO_2 converter disposed in a chamber in which the temperature is maintained above the dew point temperature of the sample gas. Further, the systems of claims 1 and 22 each comprise a dryer (or means for removing water) that is downstream of the NO_2 converter. Claims 25 and 33 each recite a method that includes converting NO_2 using a catalytic NO_2 converter adapted for use at temperatures above the dew point temperature of the sample gas. Further, each of these claims further recites removing water downstream of the NO_2 converter.

All of the above features are in direct contrast to the system shown in Figure 1 and the accompanying text of the application. As shown in Figure 1 and discussed in paragraph 20, the sample gas in the depicted prior art system is passed through a heated line to a sample room where it is passed through a dryer prior before passage to an NOx analyzer, which includes an NO_2 converter. The system is clearly distinguishable from the systems of the claimed invention.

For at least these reasons, the Applicants submit that the paragraph 4 rejection under 35 U.S.C. 102(b) of claims 1, 22, 25 and 33 and their dependent claims 8-11, 24, 27, 29-31 and 34 should be withdrawn.

B. Paragraph 5 Rejection of Claims 1, 9-11, 22, 24, 33 and 34

In paragraph 5 of the Office Action, claims 1, 9-11, 22, 24, 33 and 34 were rejected under 35 U.S.C. 102(b) as assertedly anticipated by the teachings of a 1972 paper by R.D. Jaquot and E.A. Houser entitled "Qualification Testing of an Infrared Analyzer System for S)2 and NO in Power Plant Stack Gas" ("Jacquot Paper"). The Applicants respectfully traverse this rejection.

1. The Jacquot Paper

The Jacquot Paper discloses a system for monitoring SO_2 and NO concentration levels in power plant exhaust gas. The system is described as a "'typical' low pressure design" that provided for hot filtration, pumping and reduction of sample dew point to 35°F at 5psig. Jacquot Paper, page 1, col. 2. The system is described in an original configuration shown in Figure 1 and a modified configuration shown in Figure 2. the pertinent features of the two configurations are the same. Both

systems include a probe for sampling gas from an exhaust flue. A heated exhaust line carries the sample gas from the probe to an instrument house. In the Legend to Figure 2, this line is stated to be a 50 foot heated and insulated stainless steel pipe. Once inside the instrument house, the sample gas is passed, in sequence, through a heated filter, a pump, a refrigerated condenser, one or more additional filters and then to the NO and SO_2 analyzers. In both systems, the flow is split after passage through the condenser.

The original system includes span gas sources and lines configured for introducing span gas into the individual sample gas lines downstream of the condenser and the split into two lines. The modified system includes span gas sources and lines configured for introducing span gas upstream of the condenser. The Jacquot Paper discloses the following calibration method using calibration gas (span gas):

> (Begin with both analyzers operating on plant samples.)
>
> 1. Introduce SO_2 upscale standard for 5 minutes; readjust SO_2 analyzer zero control for correct upscale calibration point.
> 2. Introduce NO upscale standard for 5 minutes; readjust SO_2 analyzer zero control for correct upscale calibration point.
> 3. Return to plant samples.
>
> Jacquot Paper, page 5, col. 1.

The Jacquot Paper discloses testing for drift in analyzer response by periodically testing with zero gas and with upscale calibration gas. Jacquot Paper, page 6, col. 2. There is no discussion of determining overall system bias.

2. The Jacquot Paper Does Not Disclose the Features of Independent Claims 1, 22 and 33

The features of claims 1, 22 and 33 were discussed above. The Applicants respectfully submit that the Jacquot Paper clearly does not disclose the features of these claims. Specifically, the Jacquot Paper does not disclose an emissions monitoring system comprising a chamber positioned adjacent the stack, an NO_2 converter disposed in the chamber interior, the NO_2 converter being operable at temperatures above the dew point temperature of the sample gas to convert NO_2 gas in the sample gas to NO gas, and means for removing water from the sample gas, the means for removing being disposed adjacent the chamber downstream of the chamber.

The Jacquot Paper does not disclose the use of an NO_2 converter or any method of monitoring emissions that includes the step of converting NO_2 in the sample gas to NO. Clearly, then, there is no disclosure or suggestion of a sequence in which a sample gas is passed through an NO_2 converter then a dryer or other means for removing water. These reasons alone are enough to distinguish the Jacquot Paper.

For at least these reasons, the Applicants submit that claims 1, 22 and 33 are patentable over the Jacquot Paper and that the rejection of these claims under 35 U.S.C. 102(b) should be withdrawn. The Applicants further submit that, by virtue of their dependency on allowable independent claims, claims 9-11, 24, and 34 must also be patentable over the Jacquot Paper. The Applicants therefore request that the rejection of these claims be withdrawn as well.

C. Paragraph 7 Rejection of Claims 1-5, 8, 9, 10-16, 19, 21-27 and 29-34

In paragraph 7 of the Office Action, claims 1-5, 8, 9, 10-16, 19, 21-27 and 29-34 were rejected under 35 U.S.C. 103(a) as being assertedly unpatentable over Izumi, Japanese Patent No. JP 51-003289 (Izumi Reference) in view of the Jacquot Paper and Matsuda, U.S. Patent No. 3,977,836 ("Matsuda Patent") or Burrows, U.S. Patent No. 5,739,038. The Applicants respectfully traverse this rejection.

The Izumi Reference, the Matsuda Patent and the Burrows Patent were discussed in detail in the Amendment and Response filed May 12, 2004 (Amendment 1), which was filed with an English language translation ("Translation") of the Izumi Reference.

1. The Izumi Reference

Briefly summarized, the Izumi Reference is directed to a system and method for determination of trace amounts of nitrogen oxide (NOx) in exhaust gas. In the described methods, the NOx present in the exhaust gas is first converted to NO2. Translation, page 5, lines 11-13. The NO_2 is then determined directly or the NO_2 is reduced to NO, which is then determined quantitatively. Id. With reference to Figure 1 of the Izumi Reference, the basic Izumi system includes, in sequence, a sampling probe 2, a dust filter 3, a first pipeline 4, a pump 5, a second pipeline 6, a. flow meter 8, a third pipeline 9, an oxidation reaction tank 16, a fourth

pipeline 17, a pyrolysis chamber 18, and a fifth pipeline 19. Heating devices 22 consisting of a heater and insulation material is used to heat the pipelines 4, 6, 9 and the dust filter 3. Other heating devices 23, 24 are used to heat the oxidation reaction tank 16 and the pyrolysis reactor 18. Translation, page 6, line 33 to page 7, line 2; page 8, lines 14-17; page 9, lines 5-7; and Figure 1. In an optional embodiment, partially illustrated in Figure 4, the system UV cell 20 is replaced by an NO_2 converter 31 downstream of the pyrolysis chamber 18, a dehydration device 33 and CLA detector 34. Translation, page 10, lines 16-24. The dehydration device may be an electronic cooling system that removes water that would be harmful to the CLA detector 34.

2. The Combined Teachings of the Cited References Do Not Teach Disclose or Suggest the Features of Independent Claims 1 and 12

With respect to claims 1 and 12, the Izumi Reference does not disclose an emissions monitoring system comprising a chamber positioned adjacent the stack, means for maintaining in the chamber interior a temperature above a dew point temperature of the sample gas, at least one sample gas line having a portion disposed in the chamber interior, an NO_2 converter disposed in the chamber interior downstream of means for removing particulate matter, the NO_2 converter being operable at temperatures above the dew point temperature of the sample gas to convert NO_2 gas in the sample gas to NO gas and means for removing water from the sample gas, the means for removing being disposed adjacent the chamber and downstream of the chamber. All of these features are present in claims 1 and 12.

In Figure 4, the Izumi reference discloses a system variation in which an NO_2 converter 31 is positioned downstream of a pyrolysis reactor 18. With reference to Figure 1, the pyrolysis reactor is downstream of an oxidation reaction chamber 16, a pump and a dust filter 22. All of these components and the pipeline 19 connecting the reactor to the NO_2 converter are heated. Given the intervening equipment, the NO_2 converter 31 is clearly not disposed in a chamber adjacent the stack. Moreover, there is no suggestion that the NO_2 converter is disposed in any form of temperature controlled environment. In contrast, claim 1 of the Application recites means for maintaining a temperature in the chamber interior above the dew point temperature of the sample and the NO_2 converter is adapted to be operable in this environment.

It can therefore be seen that the Izumi reference does not teach, disclose or suggest the features of claims 1 and 12. The teachings of the Jacquot Paper and the Matsuda and Burrows Patents, even if combined, do not cure the deficiencies of the Izumi Reference with respect to claim 1. As discussed above, the Jacquot Paper does not disclose the use of an NO_2 converter or any method of monitoring emissions that includes the step of converting NO_2 in the sample gas to NO. As was noted in Amendment 1, the Matsuda and Burrows Patents do not contain any discussion regarding the placement of an NO_2 converter relative to other components in a combustion emission monitoring system. Nor do these references discuss the effects of moisture on system bias.

The Applicants therefore submit that claims 1 and 12 are patentable over the combined teachings of the Izumi Reference, the Jacquot Paper, the Matsuda Patent and the Burrows Patent. The Applicants therefore request that the rejection of claims 1 and 12 under 35 U.S.C. 103(a) be withdrawn.

The Applicants further submit that because claims 2-4, and 8-11 are dependent on claim 1 and claims 13-16, 19 and 21 are dependent on claim 12, these claims are also patentable over the cited references. The Applicants therefore request that the rejection of claims 2-4, 8-11, 13-16, 19 and 21 be withdrawn as well.

3. The Combined Teachings of the Cited References Do Not Teach Disclose or Suggest the Features of Independent Claim 22

With respect to claim 22, the Izumi Reference does not disclose an emissions monitoring system comprising a chamber positioned adjacent the stack, a chamber heater adapted for maintaining in the chamber interior a temperature above a dew point temperature of the sample gas, at least one sample gas line having a portion disposed in the chamber interior, an NO_2 converter disposed in the chamber interior downstream of means for removing particulate matter, the NO_2 converter being operable at temperatures above the dew point temperature of the sample gas to convert NO_2 gas in the sample gas to NO gas and a dryer disposed adjacent the chamber and downstream of the chamber. All of these features are recited in claim 22.

As discussed above, there is no suggestion in the Izumi reference of a system having an NO_2 converter disposed in a chamber adjacent the stack. Further, there is no suggestion of a heater for

maintaining an environment in which the temperature is above the dew point temperature of the sample gas or of an NO_2 converter adapted to be operable in this environment.

As with claims 1 and 12, the teachings of the Jacquot Paper and the Matsuda and Burrows Patents, even if combined, clearly do not cure the deficiencies of the Izumi Reference with respect to claim 22. The Applicants therefore submit that claim 22 is patentable over the combined teachings of the Izumi Reference, the Jacquot Paper, the Matsuda Patent and the Burrows Patent. The Applicants therefore request that the rejection of claim 22 under 35 U.S.C. 103(a) be withdrawn.

The Applicants further submit that claims 23 and 24 are dependent on claim 22 and are therefore also patentable over the cited references. The Applicants therefore request that the rejection of claims 23 and 24 be withdrawn as well.

4. The Combined Teachings of the Cited References Do Not Teach Disclose or Suggest the Features of Independent Claims 25 and 32

With respect to claim 25, the Izumi Reference does not disclose a method of monitoring a concentration level of NO_x in an exhaust stream wherein the method comprises cooling a sample gas to a temperature below about 350 °F but above a dew point temperature of the sample gas, converting NO_2 in the cooled sample gas to NO by passing the sample gas through a catalytic NO_2 converter adapted for operation at temperatures above the dew point temperature of the sample gas, and removing water from the sample gas by passing the gas through a dryer downstream of the NO_2 converter.

With respect to claim 32, the Izumi Reference does not disclose a method of monitoring a concentration level of NO_x in an exhaust stream wherein the method comprises cooling a sample gas to a temperature below about 350 °F but above a dew point temperature of the sample gas, converting NO_2 in the cooled sample gas to NO by passing the sample gas through a catalytic NO_2 converter while maintaining the temperature of the sample gas above the dew point temperature of the sample gas and subsequently cooling the sample gas to a temperature sufficient to cause water in the sample gas to condense out of the sample gas.

For the reasons discussed above with respect to the system claims, it is clear that the combined teachings of the Izumi Reference, the Jacquot Paper and the Matsuda and Burrows Patents

do not teach disclose or suggest the features of claims 25 and 32. The Applicants therefore submit that claims 25 and 32 are patentable over the cited references. The Applicants therefore request that the rejection of claims 25 and 32 under 35 U.S.C. 103(a) be withdrawn.

The Applicants further submit that claims 26, 27 and 29-31 are dependent on claim 25 and are therefore also patentable over the cited references. The Applicants therefore request that the rejection of claims these claims be withdrawn as well.

5. The Combined Teachings of the Cited References Do Not Teach Disclose or Suggest the Features of Independent Claim 33

As was pointed out in Amendment 1, the combined teachings of the Izumi Reference and the Matsuda and Burrows Patents do not teach, disclose or suggest a method of monitoring a concentration level of a constituent in an exhaust stream wherein the method comprises determining an overall system bias using the known span gas constituent concentration level, the sample gas constituent concentration level and the combined sample and span gas constituent concentration level. This argument was not addressed in the Office Action.

The Applicants submit that the Jacquot Paper also lacks any teachings of such a method. At most, the Jacquot Paper discusses the use of span gas for the purposes of calibrating a system's analyzers and for determining any drift in the analyzers' output readings. There is no suggestion of using span gas for the purpose of determining system bias.

The Applicants therefore submit that the combined teachings of the cited references do not teach, disclose or suggest the features of claim 33. For at least this reason, the Applicants respectfully submit that the rejection of claim 33 under 35 U.S.C. 103(a) should be withdrawn.

Because it is dependent on claim 33, the Applicants submit that claim 34 must also be patentable over the cited references. The Applicants therefore request that the rejection of claim 34 also be withdrawn.

D. Paragraph 8 Rejection of Claims 6, 7, 17 and 18

In paragraph 8 of the Office Action, claims 6, 7, 17 and 18 were rejected under 35 U.S.C. 103(a) as being assertedly unpatentable over the Izumi Reference in view of the Jacquot Paper and Matsuda Patent or Burrows Patent. The Applicants respectfully traverse this rejection.

Claims 6 and 7 are dependent on claim 1, which has been shown to be patentable over the cited combination of references. Claims 17 and 18 are dependent on claim 12, which has also been shown to be patentable over the cited combination of references. The Applicants therefore submit that the rejection of claims 6, 7, 17 and 18 under 35 U.S.C. 103(a) should be withdrawn.

III. CONCLUSION

For at least the reasons set forth above, the Applicants respectfully submit that claims 1-19, 21-27 and 29-34 are in condition for allowance. The Applicants therefore request that the present application be allowed and passed to issue.

Should the Examiner believe anything further is desirable in order to place the application in even better condition for allowance, the Examiner is invited to contact the Applicants' undersigned representative.

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